Northern plateau.—1st, 3d, 5th, 9th to 17th, 19 to 25th, 28th, 29th, 30th.

North Pacific coast region.—5th, 9th, 11th, 14th to 17th, 24th, 25th.

Middle Pacific coast region.—Red Bluff, 15th; Oroville, 23d, 30th; College City, 8th, 17th, 22d, 23d, 29th.

The following notes upon the thunder-storms of the month have been prepared by Junior Professor H. A. Hazen:

The collection of data, relating to thunder-storms, upon special cards, has been continued the present year. A large number of the observers of last year continue their records. It is desired that all who take an interest in this matter may aid in this work. Instructions and postage free cards will be sent any one sending his address to the Chief Signal Officer. During June nearly 3,000 distinct records have been received. The days having the largest number of storms were the 7th, 14th, 15th, 20th, 21st, and 27th. Nearly all these storms occurred to the southeast and east of quite marked barometric depressions. A special investigation of storms, at stations about four miles apart in Ohio, has been begun. The storms of the 14th, 100; of the 15th, 200; of the 20th, 225, and of the 21st, 280, have been carefully plotted upon maps, and have shown very interesting results. On the 15th destructive storms are reported from three places in Shelby county, between 13.30h. and 14h. The most extensive series of storms on this date, however, are in a belt about thirty miles wide, running across the state from west to east, with its centre in latitude 39° 30′. High winds and damaging storms are reported from twenty-one places. These began at 13.30h. in the west and ended at 18.30h. in the east. The mean velocity across the state was over forty miles per hour, while the storm-centre had a velocity less than thirty miles. The mean distance from the centre of the depression was five hundred and fifty miles in a sse. direction. These twenty-one storms were surrounded by thunder-storms of less severity and, in many instances, at the boundary of electric action, there were gentle rains without thunder.

On the 21st storms were much more general over the whole state. A group of destructive storms are found in the northeast of the state occurring between 17h. and 20h. Nearly in the centre of this were the tornadoes at Ravenna and Marlborough. As on the 15th, these storms were surrounded by those of much less intensity. The mean velocity of the barometric depression was twenty-six miles, and of the thunder-storm movement thirty-five miles. The following are given as a few of the characteristics of electric storms, as determined by the studies thus far:

1st. A barometric depression is almost an invariable accompaniment. If storms occur without such depression, they are light, and more or less sporadic.

2d. A temperature much above the normal precedes general electric action; this high temperature extends over the whole region, nearly to the low centre, or at least to where rain is falling, in which case the precipitation has a tendency to diminish the heat.

3d. The wind over this region, just before the action sets in, is from the s. or sw., and light, following the law of the gentle gradient to the north.

4th. The storms, with few exceptions, move from the sw. to the ne.

5th. They are almost invariably immediately preceded by a high wind, blowing directly from the centre of most intense action. If the wind takes any other direction, it is from a point slightly to the right of the centre of action, never to the left, *i. e.*, in a direction with the hands of a clock about the centre of action.

6th. This electric action is general over the region to the se. of a low area, though there may be frequent gaps in this region. They seem like sudden outbursts of energy in the atmosphere, dependent indirectly in some unexplained manner upon the barometric depression, though having a velocity somewhat greater than it.

ELECTRICAL PHENOMENA.

Bismarck, Dakota: from 10 p. m. of the 26th until midnight the telegraph wires were so charged with atmospheric electricity that signals were transmitted without the aid of battery, between this place and Fort Yates, Dakota.

The observer on the summit of Pike's Peak reports the following: "during a thunder-storm, on the afternoon of the 28th, unusual electrical manifestations were observed. All pointed objects, even the tips of one's fingers and eyebrows, produced a buzzing noise, resembling the sound made by bees."

OPTICAL PHENOMENA.

SOLAR HALOS.

Solar halos were observed in the various states and territories as follows:

Arizona.—17th, 30th.
Arkansas.—3d, 8th, 10th, 14th, 15th, 19th, 20th, 22d, 26th.
California.—4th, 12th, 14th, 16th, 17th, 19th, 20th, 22d, 23d, 24th, 26th, 27th.
Connecticut.—12th, 20th, 25th.
Dakota.—1st, 5th, 18th, 19th, 20th.
District of Columbia.—1st, 10th.
Florida.—1st to 4th, 8th, 9th, 27th.
Georgia.—2d, 4th, 16th, 18th, 22d.
Illinois.—5th, 9th, 15th, 24th, 25th, 30th.
Indiana.—10th, 30th.
Iowa.—5th, 26th, 30th.
Kansas.—10th, 17th, 18th, 22d, 26th, 29th, 30th.
Maine.—3d, 6th.
Massachusetts.—3d, 21st, 25th, 26th.
Michigan.—4th, 7th, 11th, 24th.
Minnesota.—2d.
Missouri.—3d, 9th, 10th, 16th, 18th, 19th, 20th, 22d, 27th.
New Jersey.—10th, 21st.
New York.—3d, 10th, 11th, 14th, 20th.
North Carolina.—3d, 4th.
Ohio.—3d, 10th, 12th, 13th, 14th, 20th, 21st, 25th, 26th, 27th.
Oregon.—2d, 3d, 4th, 6th, 7th, 8th, 22d, 23d to 29th.
Pennsylvania.—3d, 19th, 25th, 27th.
South Carolina.—2d, 4th, 19th, 25th.
Tennessee.—12th, 15th, 21st, 23d.
Texas.—El Paso, 1st.
Virginia.—3d, 12th, 19th, 29th.
Washington Territory.—19th, 27th, 28th, 29th.
Wisconsin.—Beloit, 16th.
Wyoming.—8th, 9th, 13th, 15th.

LUNAR HALOS.

Lunar halos were observed in the various states and territories as follows:

Arizona.—16th, 20th, 21st, 24th, 26th.
Arkansas.—20th, 24th, 27th.
California.—16th to 19th, 22d.
Colorado.—23d.
Connecticut.—20th, 24th.
Dakota.—17th, 24th, 25th.
Florida.—17th, 18th, 23d, 26th, 27th, 29th.
Georgia.—2d, 4th, 5th, 23d to 27th.
Illinois.—18th, 20th, 21st, 22d, 24th, 25th, 26th.
Indiana.—2d, 16th, 18th, 19th, 21st, 23d to 26th.
Iowa.—24th, 25th, 26th.
Kansas.—15th to 18th, 20th, 23d to 28th, 30th.
Kentucky.—Frankfort, 24th.
Louisiana.—New Orleans, 24th.
Maryland.—Baltimore, 21st, 24th.
Massachusetts.—19th, 20th, 21st, 25th.
Michigan.—15th, 18th, 19th, 20th, 24th, 27th.
Minnesota.—20th, 26th.
Missouri.—1st, 24th.
Nebraska.—17th, 18th, 19th, 22d, 25th, 27th.
New Hampshire.—20th, 24th, 26th, 27th.
New Jersey.—5th, 20th.
New Mexico.—Santa Fé, 17th, 21st.
New York.—19th, 20th, 24th, 26th, 27th.
North Carolina.—5th, 24th.
Ohio.—19th, 23d to 27th.
Oregon.—Albany, 23d, 27th.
Pennsylvania.—5th, 19th, 25th, 26th.
Tennessee.—20th, 21st, 22d, 24th, 25th, 28th.
Texas.—1st, 16th, 18th, 21st, 22d, 23d, 25th, 28th.
Utah.—Nephi, 19th.
Virginia.—15th to 18th, 21st, 22d, 26th, 28th, 29th.
Washington Territory.—21st, 26th, 27th.
Wisconsin.—18th, 20th 26th.

The phases of the moon during June were: last quarter, 5th, 6.59 p. m.; new moon, 12th, 5.36 p. m.; first quarter, 19th, 8.42 a. m.; full moon, 27th, 6.12 a. m.; perigee, 13th, 11.12 a. m.; apogee, 28th, 12.54 a. m.

MIRAGE.

Webster, Dakota, 1st, 2d, 8th, 9th, 23d.
Traverse City, Michigan, 21st.

Grand Haven, Michigan, 9th, 10th, 17th.
Marquette, Nebraska, 6th.
Seward, Nebraska, 26th.
Yutan, Nebraska, 30th.
Blackwell, North Carolina, 30th.
Galveston, Texas, 3d.
Milwaukee, Wisconsin, 21st, Racine Point, twenty-five miles south of station, being plainly visible.

MISCELLANEOUS PHENOMENA.

SUNSETS.

The characteristics of the sky, as indicative of fair or foul weather for the succeeding twenty-four hours, have been observed at all Signal Service stations. Reports from one hundred and sixty-two stations show 4,742 observations to have been made, of which five were reported doubtful; of the remainder, 4,737, there were 3,984, or 84.1 per cent., followed by the expected weather.

SUN SPOTS.

Prof. David P. Todd, director of the Lawrence Observatory, Amherst, Massachusetts, furnishes the following record of sun spots for June, 1885:

Date—June, 1885.	No. of new.		Disappeared by solar rotation.		Reappeared by solar rotation.		Total No. visible.		Remarks.
	Gr'ps	Spots	Gr'ps	Spots	Gr'ps	Spots	Gr'ps	Spots	
1, 10 a. m.	.....	.....	.....	.....	1	5	6	70‡	
2, 10 a. m.	0	30‡	0	0	0	30‡	5	120‡	
3, 4 p. m.	0	20‡	0	0	0	0	5	150‡	
6, 10 a. m.	1	3	.....	.....	1	3	5	80‡	
8, 10 a. m.	.....	.....	.....	.....	.....	.....	4	60‡	
9, 12 m.	0	0	1	3	0	0	3	60‡	
10, 7 p. m.	2	20‡	1	2	1	2	4	80‡	One spot very large.
11, 5 p. m.	2	10‡	0	0	1	3	6	90‡	Do.
14, 2 p. m.	5	35‡	.....	.....	.....	.....	8	80‡	
17, 2 p. m.	.....	.....	.....	.....	.....	.....	10	170‡	One spot very large.
19, 6 p. m.	.....	.....	.....	.....	0	0	5	170‡	Do.
23, 3 p. m.	2	25‡	.....	.....	.....	.....	8	140‡	

Faculæ were seen at the time of every observation. ‡Approximated.

Prof. L. G. Carpenter, of the Michigan State Agricultural College, Lansing, reports sun-spots during June, as follows: 5th, 3 p. m., six groups, sixty-four spots; 8th, 4.15 p. m., six groups, forty-seven spots; 10th, 8.30 a. m., four groups, forty-four spots; 11th, 2.15 p. m., five groups, forty-six spots; 12th, 9.30 a. m., six groups, fifty-three spots; 16th, 2.30 p. m., nine groups, fifty-five spots; 17th, 4.00 p. m., nine groups, eighty-six spots; 18th, 4.50 p. m., seven groups, sixty-six spots; 19th, 3.30 p. m., five groups, forty-eight spots; 22d, 2.15 p. m., six groups, forty-two spots; 23d, 1.45 p. m., seven groups, fifty-two spots; 29th, 2.45 p. m., eight groups, seventy-one spots; 30th, 3.00 p. m., eight groups, sixty-nine spots.

The following record of sun spots observed on board the American ship "Gatherer," which arrived at San Francisco, California, June 29th, has been received through Commander J. R. Bartlett, U. S. Navy, of the Hydrographic Office:

Date.	Lat. N.	Long. W.	Remarks.
1885.	° ′	° ′	
June 9	14 21	113 00	Two spots observed on the sun, one on the east side, the other on the upper northwest side.
11	16 15	117 45	One spot on the sun.
17	28 42	130 00	Spot on east side of sun, going up.
18	29 53	131 35	Two spots on the sun, one under and toward the centre, all going up.
19	31 14	133 20	Spots on the sun.
20	32 11	134 45	Spots shifting to the west side of the sun and growing larger.
21	32 27	135 00	Spots all over on the west side of sun.
23	35 15	137 00	Spot on the sun well over on west edge.
24	35 26	135 36	Spot well on west edge of sun, going off.
26	36 58	131 20	Spot seen on the sun, just below centre.
27	37 34	129 05	Spot on the sun, most off on the west side.

Mr. H. D. Gowey, of North Lewisburg, Champaign county, Ohio, reports having observed sun spots on the following dates: 1st, 2d, 3d, 6th, 9th, 11th, 13th, 14th, 17th, 18th, 19th, 22d, 23d, 24th, 26th, 27th, 29th, 30th.

DROUGHT.

Little Rock, Arkansas, 5th: the weather is very hot and dry; rain is much needed in this vicinity.

Escanaba, Michigan, 7th: farmers from the surrounding country report that the crops are suffering for rain. At Ford River, eight miles south of this station, no rain has fallen since May 25th.

Quakertown, Bucks county, Pennsylvania, 13th: vegetation is suffering in consequence of dry weather; it is estimated that the yield of grain will not exceed half of an average crop.

Maud, Kingman county, Kansas, 30th: the weather during the month was unusually dry; only 0.19 inch of rain fell from the 1st to 19th.

Fallston, Harford county, Maryland: between the 16th and 28th the weather was very dry and crops suffered for rain.

Somerset, Bristol county, Massachusetts: drought prevailed in this vicinity from the 8th to 28th.

Strafford, Orange county, Vermont, 30th: at the close of the month the severest drought was prevailing that has been experienced for eleven years.

New London, Connecticut: during the latter part of the month this region suffered much from drought; at the end of the month grass was burned to the roots and the crops promised but a poor yield.

Wilton Centre, Will county, Illinois, 30th: a drought has prevailed in this county since April 17th; only about three inches of rain fell during the months of May and June.

Blooming Grove, Pike county, Pennsylvania: at the close of the month the soil was very dry and the oat crop suffering for rain.

Embarras, Waupaca county, Wisconsin, 30th: although frequent rains fell during the month in the surrounding country, in this immediate vicinity drought has prevailed.

EARTHQUAKES.

Cahuenga, Los Angeles county, California: at 3.15 a. m. on the 14th a sharp shock of earthquake, of three or four seconds duration, was felt here. The vibration was from east to west.

Los Angeles, California: at about 6.14 p. m. on the 14th an earthquake shock was felt in this city. It was of from two to three seconds duration, the oscillation being apparently from east to west. The shock was sufficient to awaken persons from sleep.

The San Francisco "Daily Alta Californian" of June 15th, contained the following:

SAN BUENA VENTURA, *June 14th.*—At a quarter past three this morning two shocks of earthquake were felt in this town. They seemed to be from south to north, and lasted about twenty seconds. They were the sharpest shocks felt here for years.

The La Crosse (Wisconsin) "Daily Republican," of June 20th, contained the following:

LONDON, June 20.—Severe shocks of earthquake were experienced this morning at Berne and Geneva, Switzerland. The extent or nature of the damage has not been reported.

Salinas, Monterey county, California: at about 8.30 p. m. on the 25th a slight shock of earthquake was felt here. The vibration was from north to south.

The following is from the "New York Journal of Commerce" of June 26th:

There were several slight shocks of earthquake felt yesterday (June 25) in Invernesshire, Scotland.

Olympia, Washington Territory: at 5.26 a. m. on the 27th a heavy shock of earthquake occurred at this place. It was accompanied by a rumbling noise. The vibration was from east to west.

The following reports have been received from the Signal Service observer at Unalashka, Alaska.

April 13th.—Quite a heavy shock of earthquake, lasting only a few seconds, occurred at 7.20 p. m.

April 30th.—A slight shock of earthquake occurred at 5.30 a. m.

FOREST AND PRAIRIE FIRES.

Manistique, Michigan, 1st: forest fires, twelve miles north-